http://www.lagoonsonline.com/trouble-shooting-wastewater-lagoons.htm

MICROBIOLOGICAL AND CHEMICAL TESTING FOR TROUBLESHOOTING LAGOONS

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BOD5

High effluent BOD5 concentration can have a number of causes. These include incomplete wastewater treatment due to organic overloading, low oxygen concentration and low hydraulic detention time; physical short circuiting; high algae or sulfur bacteria growth; and sludge accumulation and loss of old sludge to the effluent. High effluent BOD5 can also be caused by high effluent ammonia concentration and nitrification in the BOD test bottle, yielding a high oxygen use in the BOD test when actual carbonaceous BOD is low.

Algae are a normal and needed biological component in a lagoon, responsible for much of the oxygen used in BOD stabilization even if the system is mechanically aerated. However, these often overgrow and increase the effluent BOD5, TSS and pH. Many species of algae occur in lagoons, and each species may impact the effluent BOD5 > 30 mg/l (noncompliance). Causes of algae overgrowth are varied, and include long system hydraulic detention time, high mixing, and old sludge accumulation which releases algal growth nutrients

Algae Overgrowth

Algae overgrowth can be diagnosed by several methods. The most direct is the microscopic examination of the effluent and counting of the algae present. An algae concentration > 3-5 x 10^5/mL generally causes an effluent BOD5 concentration >30 mg/L. Other indications of algae overgrowth include: a significant pH increase through the lagoon system, often to >9.0 in the effluent; an increase in dissolved oxygen concentration through the lagoon system, often to supersaturating by the last lagoon cell; and an effluent TSS/BOD5 ratio >2. The effluent soluble BOD5 is usually quite low when algae overgrowth is occurring.

Short Circuiting

Short circuiting is the passage of untreated wastewater through the lagoon system in a short period of time.

Seasonal Occurrence of Effluent Problems

Most of the lagoon problems that affect effluent quality occur seasonally, and the time of year of the problem can help diagnose the cause.

Organic overloading and low dissolved oxygen conditions can occur at any time , but are most pronounced at colder temperature when algae growth and algal oxygenation are low. Short circuiting can also occur at any time, but occurs most often in the wintertime when the lagoon temperature is low but the influent wastewater is warm. The warmer wastewater tends to no mix with the colder lagoon water and flows across the surface of the lagoon to the effluent without mixing.

Other useful links:

http://www.bionetix-international.com/resources/troubleshooting.html

http://www.nrcresearchpress.com/doi/abs/10.1139/l84-073#.VP7zwdRza9I

Abstract

Facultative lagoons are of great importance to small communities of Alaska and northern Canada. Severe climatological conditions along with seriously impeded economic development have dramatically reduced the viable alternatives available for wastewater treatment. Design engineers face almost formidable constraints when attempting to produce “secondary” effluents for these communities. Because of permafrost, the absence of electrical power, average annual temperatures as low as −12 °C (10°F), the lack of skilled manpower, and other operating restrictions, lagoons can be of strategic importance to water quality protection in these locations.The use of “southern” technology may not be applicable under arctic–subarctic conditions and even if it is applicable it must be used with considerable reservation. This paper reviews the use of facultative lagoons in cold climate areas and addresses issues of design parameters, economics, and the system's ability to meet wastewater treatment regulations and water quality standards. Consideration of factors influenced by temperature including psychrophilic organisms and ice cover are reviewed in this discussion along with a “common sense” approach to design. *Key words*: lagoons, cold, permafrost, wastewater, design, BOD, ponds, facultative, algae, northern, ice, anaerobic, kinetics, arctic